The Dominican Republic

AGLIPO Agricultural Development Project (2)

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Field Survey: November 2005

1. Project Profile and Japan's ODA Loan

Map of Project Area

Secondary irrigation channel and farm road

1.1. Background

There were concerns in the Dominican Republic[1] that the country is dependent on imports of rice for consumption as a staple food and the domestic water supply is insufficient. However, there is little cultivated land with irrigation equipment and many paddy fields face problems such as poor drainage and damage from salt, which hinder attempts to increase production[2]. The present project was carried out in the districts of Aguacate and Guajabo, in the country's northern region. In the 1994 survey, this was the main rice-producing region, accounting for approximately 80% of the country's rice crop, but the majority of the areas where the project was carried out did not have irrigation facilities; rice cultivation was inefficient, relying on regenerated water or rainwater. For this reason, the efficient use of water through the installation of new irrigation and drainage facilities was seen as a matter of urgency, and it was also hoped to increase rice production by enabling two crops a year to be grown. The present project is a continuation of the AGLIPO Agricultural Development Project (1), which was carried out from 1983 to 1989 in the El Paso district to the northwest of the districts where the present project was carried out. As this agricultural development project will contribute to

[1] The Dominican Republic has a population of 8.5 million people and covers an area of 48,670 km^2; this is roughly the same as the population of Tokyo's 23 wards (8.48 million) and the area of Kyushu and Kochi Prefecture combined (49,285 km^2).

[2] At the time the survey was carried out (1994), no more than approximately 20% (236,000 ha) of the total cultivated land in the Dominican Republic had irrigation equipment. The total area of paddy fields at the time was 184,000 ha, of which over 50% suffered problems of poor drainage or salt damage (from compiled survey data).

strengthening the country's system for self-sufficiency in rice, it should ideally be implemented at an early stage.

1.2. Objective

The project aims to increase rice production and strengthen the system for self-sufficiency in rice, thus contributing to an increase in the income of farmers and the creation of job opportunities, through the installation of irrigation and drainage facilities in the districts of Aguacate and Guajabo in the northeast of the Dominican Republic.

1.3. Borrower/Executing Agency

The Government of the Dominican Republic/Instituto Nacional de Recursos Hidráulicos (INDRHI)

1.4. Outline of Loan Agreement

Loan Amount/ Disbursed Amount	9.013 billion yen/8.765 billion yen
Exchange of Notes Loan Agreement	November 1993 / March 1994
Terms and Conditions - Interest Rate - Repayment Period (Grace Period) - Procurement	 3.0% 30 years 10 years General untied
Final Disbursement Date	December 2003
Works Agreement	Ingco (local company), Impregilo S.P.A. (Italian company)
Consulting Agreement	Pacific Consultants International, E.A.Roa & Asociados (local company)
Feasibility Study (F/S) etc.	1985-86: JICA 1992: Revisions by Government of the Dominican Republic

2. Evaluation Result

2.1. Relevance

2.1.1. Relevance at the time of appraisal

Under the five-year public investment plan (1992–1996) at the time of the appraisal, agricultural development and the installation of irrigation facilities were considered to be major problems and there was concern about the insufficient rice production. There was an increasing need to install irrigation equipment in the northern region of the country, which is the main rice-producing area. Furthermore, the paddy fields in the area where the present project was carried out suffered damage through water shortages because of the dependence on regenerated water or rainfall for irrigation, which increased the importance of the present project to install new irrigation and drainage facilities.

2.1.2. Relevance at the time of evaluation

Increased competitiveness of agricultural produce, fair development of agricultural communities, reform of agricultural systems, and concern for the environment are considered to be priority issues under the 10-year strategy of the Department of Agriculture and Livestock (2000–2010); this strategy calls for improved rice production and improved incomes for farmers. The northern region currently accounts for as much as 94%[3] of the country's total rice production, but improved efficiency in water use and improved productivity of irrigated agriculture are seen as issues and there is still a need to continue promoting the installation of irrigation and drainage facilities. The present project enables two crops a year to be grown and together with the first project, AGLIPO Agricultural Development Project (1), it is contributing to increased rice production; as it is responsible for strengthening the Dominican Republic's system of self-sufficiency in rice, the present project continues to have a high degree of importance[4].

2.2. Efficiency

2.2.1. Output

Table 1 shows the planned outputs and the actual performance of the present project. The location of the construction work was changed following a review of the optimum location for the head works that had been decided when the detailed

[3] From Instituto Nacional de Recursos Hidráulicos (INDRHI) data

[4] Although the Dominican Republic's level of self-sufficiency in rice reached almost 100% in 2002, production later fell as a result of heavy rains in the northern region as well as pest and disease outbreaks across the whole country, and rice imports commenced again in 2004. The risk of having to import rice as a result of natural disasters should be addressed in the future.

design was drawn up in 1997. In line with this change, the length of the extensions to the irrigation and drainage channels was reduced, and the length of the extensions to the farm roads along these channels was also reduced. Because some areas were to be irrigated using existing pump equipment at the time the detailed design was drawn up, the irrigated area was changed from 7,500ha to 7,000ha at the time of the appraisal. According to the INDRHI, the area under irrigation was 7,343ha as of 2005, exceeding the planned figure set after the detailed design was drawn up.

Table 1: Comparison of Outputs

Item	Plan (At the Time of Appraisal)	Plan (After Detailed Design)	Actual
1) Head works[5]	Dam height 3.8m, dam length 68.5m	Height 4.2m, length 56.0 m	As in plan drawn up after detailed design
2) Irrigation channels	Total: 273km Total: 181km	Total: 125km Total: 135km	Total: 112km Total: 139km
3) Drainage channels	Total: 195km	Total: 130km	Total: 141km
4) Farm roads			
5) Area irrigated	7,500ha	7,000ha	7,343ha
Additional Outputs		6) Concrete walls on irrigation channels: 60km 7) Auxiliary works on drainage facilities: 135 places 8) Extensions to shed at head works and other places	As in plan drawn up after detailed design As in plan drawn up after detailed design As in plan drawn up after detailed design

Source: INDRHI

The additions to the outputs at the time of the detailed design are as follows:

Following the results of soil tests carried out at the time of the detailed design, the walls of the irrigation channels were changed from mud to concrete to prevent leakage. Total: 60 km

Auxiliary works on drainage facilities includes longitudinal and latitudinal culverts, spillways, etc.

Extensions were constructed to the sheds at two regulation facilities in order to house the sluice gate regulation machinery.

[5] A general term for the facilities for collecting river water for use in irrigation channels. These comprise ①a dam to regulate the headwater level built across the Yuna River, which runs through the project districts; ②intake ports to collect water for irrigation; ③secondary facilities and maintenance facilities, etc.

2.2.2. Project Period

The planned period of the project at the time the appraisal was carried out was 70 months, from March 1994 to December 1999. However, the project was set back a total of 48 months (four years) and actually took 118 months, lasting until December 2003. The reasons for this were a delay in the start to the procedures for selecting a consultant (approximately 13 months), an extension in the time for these procedures (approximately 13 months), a lengthening of the discussions concerning the tendering requirements for contractors and delays in agreement over contract alterations (approximately 21 months), delays in procurement and completion resulting from defects[6] in some of the materials, etc.

2.2.3. Project Cost

As a result of efficient orders by international competitive tendering and changes in the scope of the project from the time of the detailed design, the overall cost was reduced from the original plan of 12,017 million yen to 9,691 million yen, about 80% of the original figure.

2.3. Effectiveness

2.3.1. Yearly Increase in the Area Planted with Rice

Table 2 shows the planned yearly increase in the area planted with rice and the actual performance. The increases during the first and second years following the completion of the project exceeded the plans. The second year after project completion saw an increase in the order of 1,000ha less than the first year, but this is presumed to be the result of disease to the rice plants and the effect of prolonged rains, which will be examined in detail in the following section.

Table 2. Area Planted with Rice by Year

Reference year	Plan[7] (ha)	Performance (ha)
First year following project completion (expected to be 1999 at the time of appraisal; performance is harvest from fiscal 2003–04[8])	4,482	8,619
Second year following project completion (expected to be 2000 at the time of appraisal; performance is harvest from	7,113	7,620

[6] Defects were identified in the quality of the rubber materials procured for use in the intake weir of the head works; a delay was unavoidable while the materials were procured again. This delay affected the construction schedule.

[7] These figures are extrapolated from the planned rice production at the time of the appraisal, and show the total increase in the area planted with annual and twice-yearly crops. In the case of newly-created paddy fields, several rice harvests are generally required until the soil becomes suited to rice growing. The build-up period from the completion of the project until achievement of the target rice yield was taken to be five years.

[8] The harvest year is from November until October of the following year. Because the irrigation channels were first filled with water in March 2004, the data for the harvest year of 2003-2004 shows the total from April to October 2004. The data for October 2005 in the harvest year 2005-05 are not shown, as they are currently being collected by the INDRHI.

fiscal 2004–05) Fifth year following project completion (expected to be 2003 at the time of appraisal)	15,000 （7,500ha x 2）	-

Source: Agricultural Statistics Department, INDRHI

2.3.2. Increase in Rice Production (Production Volume)

Table 3 shows planned and performance figures for rice production, production increase, and yield per unit area. In the first year following completion of the project, production and production increase both greatly exceeded the planned figures, and the yield per unit area reached about 90% of the planned figure. However, part of the project district was greatly affected by the outbreaks of disease[9] that have occurred across the whole country from 2004 onwards and by the tropical storms and heavy rains that have occurred intermittently since the completion of the project; the effects started to be felt in the second year following project completion, and all of the indicators for the second year were very much less than for the first year following project completion[10]. The INDRHI is currently carrying out drainage works in Guajabo and other areas[11] in order to resolve this problem.

Table 3. Comparisons of Rice Production, Production Increase, and Yield Per Unit Area

(Upper figures for first year following project completion, lower figures for second year)

Indicator for Comparison	Plan	Performance	Comparison with Plan
1) Production (tons) Target Figure for Five Years after Project Completion: 90,000 tons	26,890 42,680	48,310 24,674	180% 58%
2) Production Increase (tons) Target Figure for Five Years after Project Completion: 78,890 tons	15,780 31,570	37,200 13,564	236% 43%

[9] A disease of rice plants called *vaneamiento* (which means that the ears of rice do not ripen sufficiently) has spread across the whole country. The causes are believed to include abnormal weather conditions such as high temperatures and heavy rain, viruses, and rice blast, but the details are not fully understood.

[10] In the east of the district of Guajabo in particular, the drainage situation worsened as a result of tropical storms and prolonged rain; the resulting intermittent floods proved to be a handicap to rice production. There was particularly serious damage as a result of the flooding of the lower reaches of the Yana River in June 2004, and all the farmers resident in the eastern region responding to the beneficiaries' questionnaire (16) responded that rice production had fallen because of this water damage.

[11] The works commenced in August 2004, with the main purpose being to resolve the problem of flooding in the district of Guajabo. Completion is scheduled for February 2006. The project involves ①dredging the mouth of the Yana River and riverbank reinforcement work in the downstream region, ②work on measures to improve drainage, and ③ restoration work after a flood that occurred in June 2004.

3) Yield Per Unit Area	6.0	5.3	88%
Target Figure for Five Years after Project Completion: 6.0 tons/ha	6.0	4.1	68%

Source: Agricultural Statistics Department, INDRHI. Figures for production and production increase are based on unhusked rice.

2.3.3. Organization of Irrigation Associations and Rates of Collection of Water Charges

As a result of the lessons learned from the first AGLIPO project, an organization of irrigation associations was created under the present project before the completion of the project. The lowest branch of this organization is the *nucleo*, each made up of 38 irrigation associations; the next branch up consists of four *asociaciones*, which unite the *nucleos* into groups; at the top is the highest level of the organization, the single *junta*. This is the first time such a measure has been carried out in the Dominican Republic, and with success in the early stages of creation of the organization, the rate of collection of water charges reached 72% in the second year following completion of the project[12]. All the farmers in the project district currently participate in irrigation associations (with a 100% rate of incorporation of the associations into the organization) and the rate of collection of water charges is forecast to increase.

2.3.4 Estimation of the Economic Internal Rate of Return (EIRR)

When the Estimation of the Economic Internal Rate of Return (EIRR) was recalculated using the same conditions as at the time of the appraisal, (project costs being construction costs and maintenance costs, profits being the remainder of the profits for crops after production costs are subtracted and the project life being 30 years), it came to 14.6%. This is a slight reduction on the figure of 17.1% calculated at the time of the appraisal, but it is still at a high level.[13]

2.4 Impact[14]

2.4.1. Increase in Farmers' Revenue

[12] Data from the INDRHI Agricultural Statistics Department. According to the department, irrigation associations with the collection rate of over 90% seen in other regions may be expected a certain length of time after completion of the project. However, it is extremely rare to achieve a 72% rate just two years following the completion of the project.

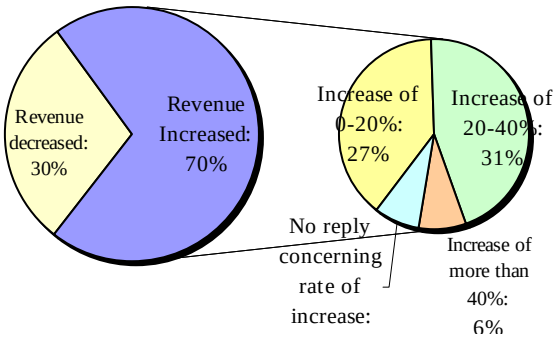
[13] In the recalculation the build-up period of five years, assumed at the time of the appraisal, was used and the production in fiscal year 2008–09 was taken to be 90,000 tons. The EIRR for the first AGLIPO project recalculated at the time of the post-project evaluation (1990) was 12.7%.

[14] Regarding resettlement in line with the present project, 51 farmhouses in the area planned for use for the head works were resettled. The INDRHI provided the resettled households with new housing and the surrounding infrastructure (water supply, electricity, telephone service, roads, etc.). The new housing was situated on high ground, so the risk of the housing being flooded was less than in the residents' original homes on the floodplain of the Yana River. In the survey of beneficiaries, all of the 54 households that responded said that there had been no problem with resettlement.

An attempt was made to ascertain the degree of improvement in farmers' incomes before and after the project through a beneficiaries' survey. Regarding incomes first, as can be seen in figure 1, the results show that 70% of farmers responded that their incomes had increased. In particular, over half of those that reported an increase in revenue responded that the increase had been by 20% or more over their pre-project revenue. On the other hand, approximately 90% of the farmers that reported a decrease in revenue were resident in the eastern part of the district of Guajabo, which was affected by tropical storms and prolonged rain.[15]

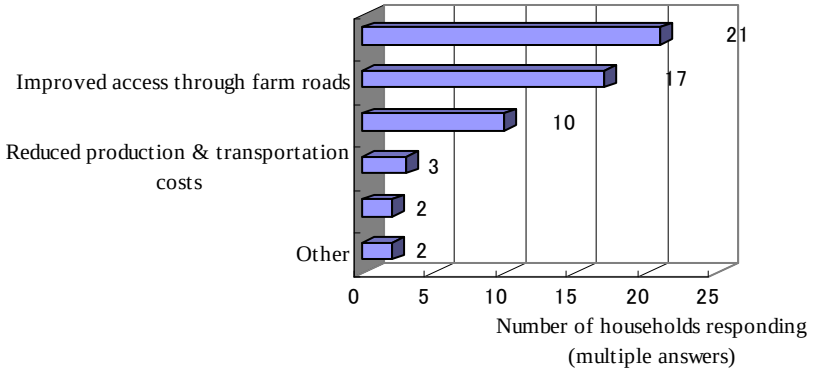
Next, to the questions regarding changes in the standard of living, about 70% of farmers responded that their standard of living had improved. Specific reasons other than increase in revenue that were given for the improvement in standard of living included (1) improved accessibility through building of farm roads,[16] (2) reduction in irrigation costs,[17] and (3) reduction of transportation costs of produce (rice) (Fig. 2).

Fig. 1 Increase in Farmers' Revenue (Results of Beneficiaries' Survey, N=54)



[15] Tropical storm Jeanne hit the Dominican Republic in September 2004, causing serious damage. There were also floods along the lower reaches of the Yana River, including in areas where the present project was carried out, in June 2004.
[16] The INDRHI points to the following three areas as the impact of improved accessibility on standard of living: ① movement to cultivated land is easier, improving the efficiency of farm labor; ②farm machinery may be taken into cultivated land, allowing cost reduction through mechanization of harvesting and other farm work; ③rice traders and sales brokers are able to enter previously inaccessible agricultural districts, reducing transport costs.
[17] Specifically, reduction in fuel costs for pumping irrigation water, etc.

Fig. 2 Reasons for Improvement in Standard of Living (Multiple Answers)



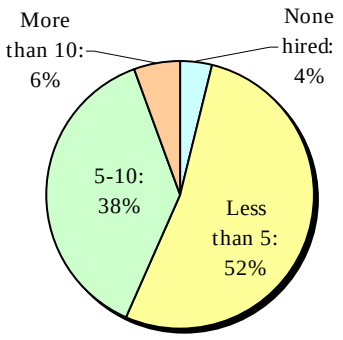
Although there is concern about the effects of natural disasters in the future, it can be concluded from the results given above that revenue in the project districts has been improved by the project and that farmers' incomes have been improved by reduction in the costs of irrigation and transport.

2.4.2. Creation of Employment Opportunities

Of the households that responded to the beneficiaries' survey, 96% responded that they had hired day laborers during the busy farming season (mainly planting and harvest). Regarding the actual numbers of people hired, approximately half (44%) of the households that had hired laborers reported taking on five or more day laborers (Fig. 3). Additionally, 37% of households that had hired laborers reported taking on 10 or more laborers during the rice planting season, which is considered to be the busiest of all periods in the rice farming calendar.

Because the project was only completed slightly less than two years ago it is still too early to conclude whether or not it will continue to create employment opportunities, but from the above survey results it can be said that a definite number of employment opportunities have been secured since the project's completion in the districts where it was carried out. According to the INDRHI, the main source of day labor is the tenant farmers living in these districts, a large proportion of whom are refugees from neighboring Haiti, where wages are very low. It can thus be concluded that the poorer social strata within the project districts have obtained employment opportunities.

Fig. 3 Numbers of Day Laborers Hired
(Results of beneficiaries' survey, N=54)



2.4.3. Foreign Exchange Savings through Strengthening the System of Self-Sufficiency in Rice

During the harvest year of 2003–04, the first year since the completion of the project, rice production increased as a result of the project by 24,180 tons (figure for unhusked rice), which accounted for a saving of US$11.20 million in foreign exchange. In 2004, 77,840 tons of rice were imported[18], for which a purchase cost of US$36.05 million was paid. If the present project had not been carried out, a total of US$47.25 million (US$36.05 million + US$11.20 million) would have had to be paid; this means that there has been a saving of approximately one quarter of the foreign currency required for purchasing rice imports (Table 4). The country's rate of self-sufficiency in rice was 83% in 2004.

Table 4. Amount of Foreign Currency Saved through Increased Rice Production (2004)

Amount Produced (tons)	Amount Consumed (tons)	Amount Imported (tons)	Cost of Imports (millions of US dollars) ***a***	Increase in Rice Production from Project (tons)	Amount of Foreign Exchange Saved (millions of US dollars) ***b***	Degree of Foreign Currency Saving ***b/(a + b)***
374,829	452,667	77,838	36.05	24,180	11.20	23.7%

Source: Secretaría de Estado de Agricultura (SEA) and INDRHI

Note: The amount consumed is taken as the total of the amount produced and the amount imported. Increase in rice produced is calculated from the figures in table

[18] Strictly speaking, the rice imports during the 2003–04 harvest year (November 2003–October 2004) should be used for comparison, but because no statistics are available the rice imports for 2004 were used instead. The amount of foreign exchange saved during the 2004–05 harvest year has not been calculated because the various different statistics are still in the process of being compiled into aggregates.

3, based on unhusked rice.

2.5. Sustainability

2.5.1. Executing Agencies

There is a clear sharing of roles in the administration and maintenance: INDRHI is responsible for the administration and maintenance of the head works, the main channels and the farm roads; the union of irrigation associations (Junta de Regantes Aglipo-II) is responsible for the administration and maintenance of the secondary channels. Settlement of newly cultivated land is the responsibility of the Instituto Agrario Dominicano (IAD), activities to encourage agriculture within the project districts are the responsibility of the Secretaría de Estado de Agricultura (SEA), and agricultural financing is the responsibility of the Banco Agricola (BA).

2.5.1.1 Technology

a) INDRHI

There were no technological problem in the administration and maintenance. Training for maintenance of the head works was carried out by the company that did the construction work, and an administration and maintenance manual has been completed. Regarding personnel, although the administration and maintenance of the present project is under the jurisdiction of the Operations Bureau of the INDRHI, no specialist technical staff has officially been assigned to the project because of the effects of an organizational reshuffle in March 2003. It is believed that the establishment of a support system in the INDRHI Operations Bureau, which includes ascertaining the optimal personnel for maintenance, will take some time.

b) Junta de Regantes Aglipo II

Training of irrigation association members in administration and maintenance was carried out by the INDHRI; however, it is only just under two years since the completion of the project, and it will require more time for the administration and maintenance skills, which include expertise in managing the irrigation associations, to be mastered[19]. Regarding the personnel, an issue to be addressed in the future is

[19] Specifically, from August to October 2005, training, seminars, and observations relating to the following were carried out: ①methods of maintenance for irrigation channels and facilities; ②use of fertilizers and agricultural chemicals; and ③administration and management of irrigation association activities. However, the results of the beneficiaries' survey show that no more than 41% of the households that responded (22 out of 54) said that the guidance was useful in maintaining the facilities. Regarding the overall administration of the irrigation associations in particular, it is expected that mastering the administration skills will take some time because the organizational structure is fairly complex, with a large number of members at the lowest level (there is one *junta* with a small number of *asociaciones* below it; the lowest level of the organization is the *nucleo*, of which there are 38). (From an interview with the training organization

the clear division of roles among the irrigation association members However, the rate of entry into the association organization of farmers in the project districts is 100%, so there are plenty of association members to carry out the work of administration and maintenance.

There are currently two projects relating to irrigation in the Dominican Republic, which are being carried out by the Japan International Cooperation Agency (JICA) and the Inter-American Development Bank (IDB)[20, 21]. These projects aim to improve the capacity of INDRHI personnel in relation to the administration and maintenance of irrigation equipment, and to smooth out the process of transferring authority over the administration and maintenance of irrigation facilities to the irrigation associations.

2.5.1.2. Organization

a) INDHRI

The Operations Bureau is the main department in charge, and it gives its support to the present project through its local office (Bajo Yuna Irrigation District Office. The bureau has 10 irrigation district offices under its jurisdiction.

b) Junta de Regantes Aglipo II

The *junta* (union of irrigation associations) is the highest level of the organization, beneath which the next level is the *asociación.* There are four *asociaciones*, each covering a separate district and carrying the responsibility for substantive administration and maintenance activities.

Following completion of the project, the union of irrigation associations called for the transfer of the machinery and tools (particularly the heavy machinery) used for operation and maintenance. The machinery and tools are now in the possession of INDHRI, which is carrying out continuous talks with the union of irrigation associations regarding their ownership. The INDHRI proposes flexible use of the

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department of the INDRHI)

[20] JICA has been implementing the Proyecto de Mejoramiento Tecnológico de la Agricultura Bajo Riego (PROMTECAR [Project for Improving Technology of Agriculture under Irrigation]) since March 2001 with the aim of improving the administration and maintenance technology of irrigation facilities; under the project, technology relating to the maintenance of irrigation facilities and water management is being transferred to the INDHRI, the Secretaría de Estado de Agricultura (SEA), and irrigation associations in model districts. The INDHRI intends to extend the results of this project across the whole country.

[21] The IDB has been implementing the Programa Administración de Sistemas de Riego Por los Usuarios (PROMASIR [Program for the Management of Irrigation Systems by Water Users]), which aims to ①install irrigation infrastructure, ②promote the transfer of control of the administration and maintenance of irrigation facilities to the irrigation associations, and ③build up the capacity of the organization of irrigation associations, etc. Technical guidance relating to the administration and maintenance of irrigation facilities has been given in 40 irrigation districts across the whole country. There have also been results through cooperation with the above JICA project.

heavy machinery across the whole country[22].

2.5.1.2. Finances

a) INDHRI

The budget for the INDHRI (amount disbursed) has varied in the region of between 1.0 billion and 1.3 billion Dominican pesos over the last few years (Table 5).

The budget for administration and maintenance of the present project amounted to 34.90 million pesos in fiscal 2004 and 40.90 million pesos in fiscal 2005, which accounted for 3.0% and 3.5% respectively of the average disbursed budget of 1.16 billion pesos over the last five years.

Table 5. INDHRI Budget (Unit: million pesos)

Fiscal Year	Amount disbursed	Amount agreed at beginning of fiscal year
2000	991	1,643
2001	1,099	1,797
2002	1,295	1,571
2003	1,283	1,868
2004	1,135	991

Note: The current exchange rate is 1 peso = approx. 3.3 yen

b) Junta de Regantes Aglipo II

The revenue of the union of irrigation associations during fiscal 2004–05 was 16.9 million pesos, of which 94% was revenue from irrigation charges. The union's expenditure was 16.2 million pesos, leaving the union approximately 70,000 pesos in the black. The INDHRI compensates the union for part of the wages paid to union officials.

The irrigation charges were increased in November 2005 from a yearly 40.82 pesos/tarea[23] to a yearly 61.03 pesos/tarea, which was a significant price hike of 50%. However, according to the results of the beneficiaries' survey the level was

[22] The INDRHI proposes that the heavy machinery should not be for the exclusive use of the project districts but should be used effectively across the whole country, and has retained possession of the machinery, for the following three reasons: ①the union of irrigation associations does not yet have the capability to manage the heavy machinery; ②the operation and maintenance expenses for the heavy machinery are considerably in excess of the financial burden the union of irrigation associations is capable of assuming; and ③demands from other regions for heavy machinery have grown as a result of the natural disasters that have occurred continuously across the country since 2004. Heavy machinery centers for the unified management of the heavy machinery used in the operation and maintenance of irrigation facilities are currently being built in four locations around the country under the PROMASIR project being carried out by the IDB. One of these is slated for construction in the northeastern region. The Junta de Regantes Aglipo II for the present project will be able to use this heavy machinery by paying a fixed usage fee to the center

[23] One tarea is approximately 0.06ha.

appropriate,[24] and it can be concluded that there is little risk of a drop in revenue due to any increase in non-payment of irrigation charges[25].

2.5.2. Maintenance

As detailed below, neither the INDHRI nor the Junta de Regantes Aglipo II carries out regular maintenance work. Ideally, a system of maintenance in line with the administration and maintenance manual should be put in place and strengthened at an early stage. Also, due to the particular soil conditions of the districts where the project was carried out the growth of weeds and the buildup of soil in the irrigation channels are both faster than in other districts. It is therefore necessary for both the INDHRI and the union of irrigation associations to recognize anew the importance of maintenance work.[26, 27]

a) INDHRI

The head works and the main channels have been maintained in the same condition as at the time of the completion of construction work, and no particular problems have occurred. Work is currently being carried out on the drainage channels to maintain and strengthen their capacity. Regarding the farm roads, the surface of the main trunk road has become uneven in places as a result of heavy rain; although the road is not impassable, there are stretches of the road where the passage of vehicles is impaired[28]. Part of the main irrigation channel was damaged in the widespread flooding of June 2006, but as a result of emergency repair work all the damaged areas have been mended.

b) Junta de Regantes Aglipo II

Although weeds have been removed by hand and herbicide has been sprayed along some of the secondary channels, partly because the maintenance system of the lower levels of the union's organization is currently being reorganized, regular

[24] 93% of households that gave valid responses responded that the amount collected in irrigation charges was not high.
[25] The INDHRI maintains that higher irrigation charges and more efficient collection of irrigation charges are necessary in order for the irrigation associations under the present project to use the heavy machinery from the heavy machinery center to be constructed in the northeastern region of the country under the IDB project.
[26] The union of irrigation associations maintains that it is unable to carry out maintenance work using heavy machinery such as silt dredging because of the present environment in which it does not have free use of heavy machinery. However, the INDHRI judges that heavy machinery is not necessary for dredging silt from the secondary irrigation channels.
[27] In the beneficiaries survey, the four possible overall evaluations for the maintenance activities under the responsibility of the irrigation associations were "extremely good," "good," "bad," and "extremely bad"; 56% of the households that gave valid responses (30 out of 54) evaluated them as "extremely good" or "good." These results may reflect biases from the time of the beneficiaries' survey, but over half of the households do not see any problem in the current maintenance activities. Furthermore, the same trend was seen in the in responses to a question as to whether the association members were actively participating in maintenance activities: 67% of households (36 out of 54) responded that the participation was either "very active" or "active."
[28] The INDHRI says it will carry out "appropriate repairs" to the problem areas along the main road.

maintenance activities have not been carried out[29]. Furthermore, maintenance work such as silt dredging that requires backhoes, dumper trucks or other heavy machinery is not believed to have been carried out at all since the completion of the project.

3. Feedback

3.1. Lessons Learned

None

3.2. Recommendations

Recommendation 1 for the Executing Agencies and the Junta de Regantes Aglipo II

Regarding the maintenance of the irrigation facilities, there should be an early shift from the present makeshift solutions toward a system that enables regular maintenance work to be carried out; where there are any risks of a reduction in irrigation capacity due to buildup of silt, work should be carried out to prevent problems before they actually occur. Specifically, the INDHRI should appoint the staff responsible at an early stage, and the union of irrigation associations should first work to clarify the division of roles among association members. Moreover, it would be desirable for the administration and maintenance manual to be revised and updated to meet the actual situation, and for regular maintenance work to be carried out in accordance with this updated manual.

Recommendation 2 for the Executing Agencies and the Junta de Regantes Aglipo II

Regarding the problem of the ownership of the heavy machinery for maintenance, the parties concerned should work their way toward the construction of a scheme whereby the heavy machinery can be used effectively; as the capacity of the irrigation associations to administer funds grows, in the long term the ownership of the machinery should then be transferred to the union of irrigation associations. However, the Junta de Regantes Aglipo II does not yet have sufficient skills to maintain the heavy machinery; if the ownership is to be transferred, it is necessary to train the association members in maintenance and to raise again the irrigation charges, which will be the source of funds for the

[29] The reasons that regular maintenance work has not been carried out are thought to be unclear division of roles and problems in the organization of the maintenance system, to which can be added the lack of awareness of the importance of maintenance work among the individual association members referred to in footnote 27.

machinery maintenance costs. For this reason, the INDHRI and the Junta de Regantes Aglipo II should hold discussions aimed at a method of transferring ownership which is acceptable to both parties.

Comparison of Original and Actual Scope

Item	Plan	Actual
① Output 1) Head works construction	Dam height 3.8m, dam length 68.5m, planned intake flow 8.5m^3/s (after detailed plan: 10.55m^3/s)	Dam height 4.2 m, dam length 56.0 m, planned intake flow 10.55 m^3/s
2) Construction of irrigation channels	Total: 273km (after detailed design: 125km)	Total: 112km
3) Construction of drainage channels	Total: 181km (after detailed design: 135km)	Total: 139km
4) Construction of farm roads	Total: 195km (after detailed design: 130km)	Total: 141km
5) Procurement of equipment for maintenance	Backhoes, bulldozers, dumper trucks, radio system, etc.	As a result of a review of the items of maintenance equipment for procurement at the time of the detailed plan, purchase of some equipment was suspended an d there was new procurement of amphibous vehicles and other equipment.
6) Area irrigated (area benefiting from irrigation and drainage channel installation, farm road installation, reclamation of farm land, etc.)	7,500ha (after detailed design: 7,000ha)	7,343ha (as of 2005) <u>Additional Output</u> Concrete walls for irrigation channels: 60km Work in area of drainage facilities: 135 places Extension to shed at head works
②Project Period	March 1994–December 1999 (70 months)	March 1994–December 2003 (118 months)
③Project cost Foreign currency Local currency Total	7,325 million yen 4,692 million yen (469 million Dominican pe sos) 12,017 million yen	5,766 million yen 3,925 million yen (702 million Dominican peso s) 9,691 million yen

ODA Loan Portion Exchange rate	9,013 million yen 1 Dominican peso = 10.0 yen (Jan. 1993)	8,765 million yen 1 Dominican peso = 5.6 yen (monthly average Mar. 1994 –Dec. 2003)